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Some Say the Rockets' Red Glare Is Eating Away at the Ozone Layer

By WILLIAM J. BROAD

HUNDREDS of rockets roar to life every year, some trailing clouds of toxic exhaust that chew up the life-protecting ozone shield high in the atmosphere. How much ozone is destroyed in this fashion is unknown, and may be small compared with indstrial pollution. But it is large enough to have worried some scientific and public-interest groups.

For their part, rocket manufacturers and users contend that the problem is insignificant and that the cost of correcting it would far outweigh the possible benefits.

The ozone is harmed by solid-fuel rockets, whose exhausts often contain large amounts of hydrochloric acid. Chlorine, when released from the acid, rapidly breaks down ozone molecules, letting more of the sun's ultraviolet light penetrate the atmosphere and raising the risk of skin cancer. In contrast, the exhaust from liquid-fuel rockets is typically composed of water and carbon dioxide.

No one knows how many solid-fuel rockets are fired each year, or how many fly high enough to destroy ozone. The United States Space Command, based in Colorado Springs, Colo., which keeps tabs on global rocket launchings of all types, estimates that 500 to 600 rockets were

fired every year during the 1980's, with the number peaking in 1989 at 1,500. These firings ranged from space shuttles and large American rockets to relatively small Scud missiles, which are liquid fueled.

Despite the unknowns, some scientists have concluded that the ozone damage, though now perhaps slight, is worrisome because of the trend to increasing use of solid-fuel rockets around the world. In March 1990, a panel of the National Research Council of the National Academy of Sciences, which advises the Federal Government, called for a switch to liquid propellants, saying this would eliminate rocket-born "pollution of the atmosphere."

In June 1990, the signatories to the Montreal Protocol, which seeks to ban substances that deplete ozone, directed the group's scientific el

The shuttle is the main focus of debate because of its huge solid-fuel boosters.

cant part of the problem," said Allan J. McDonald, vice president for space operations of the Thiokol Corporation in Brigham City, Utah, which makes solid-fuel rockets. Among the general public, he added, "there's an overreaction leading toward hysteria."

Switching to new fuels, Mr. McDonald said, would cost billions. "It would be a waste," he said. "We ought to spend that money cleaning up the CFC problem." CFC's, or chlorofluorocarbons, are industrial chemicals that constitute the chief cause of ozone destruction.

The main focus of the rocket debate is the shuttle, whose 149-foot tuin boosters are the largest solid-fuel rockets in the world. The National Aeronautics and Space Administration estimates that each shuttle flight injects some 75 tons of chlorine into the stratosphere, the ozone-rich layer a dozen or so miles above the earth.

A different type of large booster

helps power the Titan 4, this com-
try's largest unmanned rocket. Its
twin boosters are 113 feet tall.
Dr. Michael J. Prather, an atno-
spheric scientist at NASA's Goddard
Institute in New York City, and his
colleagues have calculated that the
lofting of nine shuttles and six Titan
4's every year would add a mere 0.3
percent to the annual burden of
stratospheric chlorine, which in tum
would destroy far less than 1 percent
of the ozone there.
A Worrisome Trend in Rocket Emissions
In development
U.S.A.
Space
shuttle
boosters
149 ft.
Titan 4
boosters
113 ft.
"As a point source of pollution, the
shuttle is clearly large," Dr. Prather
said in an interview. "But compared
to any other industry-refrigeration,
foam blowing, solvents - it's small."
Shuttle's Benefits Cited
Nonetheless, some groups have at-
tacked the shuttle as a serious envi-
ronmental hazard, and the most caus-
All these rockets
Japan U.S.S.R. either have solid-
Europe
Arlane 4
boosters
39 ft.
H-2
rocket
80 ft.
Arlane 5*
rockets
98 ft.
tic criticism has come from the Sovi-
ets. Aleksandr I. Dunayev, head of the
Soviet space agency, Glavkosmos,
was quoted in a 1989 Russian publica-
tion, Literaturnaya Gazeta, as say-
ing, "About 300 launches of the shut-
tle each year would be a catastrophe
and the ozone would be completely

destroyed.'

New Species of Whale Is Discovered in Pacific

Pieter Arend Folkens

Artist's reconstruction of the beaked whale Mesoplodon peruvianus, based on six of the dead specimens and clues from other known species.

A N elusive gray creature that looks more like a dolphin than Moby Dick has been identified as the first new species of whale to be discovered in 28 years.

The newly described species, found in the Pacific Ocean off Peru, is the beaked smallest member of a group called adult male is about 12 feet long.

Dr. James G. Mead of the Smiths nian Institution, working with Julio, Reyes and Koen Van Waerebeek of the Peruvian Center for Cetaloge Studies, identified the species from 0 carcasses that got caught in fishing nets or that washed tice for so long is a mystery. The scientists suggest that members of this species primarily live far from shore, keeping to themselves and avoiding ships.

"I think the sudden appearance of this species represents a movement the population nearer to shore Mes■plodon, which means "armed with a tooth in the middle of the jaw." M. peruvianus is distinguished from other species of Mesoplodon by the size and position of its teeth, its relatively tiny cranium and its over- all small size.

Most of the little that is known about Mesoplodons and the larger od

SS-20 missile 52 ft. fuel rocket boosters or are solid-fuel rockets themselves. Their emissions make them potential culprits in the

mysterious loss
of ozone. The
trend is toward
more and larger
rockets with more
emissions.
The New York Times
Western experts note that the Soviets are struggling to market their own rockets, which use liquid fuel more frequently than do those in the West.
An American group known as the Military Toxics Network, based in Seattle, says in a report entitled "No Free Launch" that each firing of the American shuttle or Titan 4 destroys more ozone "than the annual ground-level emissions of chlorofluorocarbons from most individual industrial plants."
Dr. Prather of NASA agreed, but said the shuttle's minor environmental costs had to be weighed against its great scientific benefits. For instance, in September the shuttle Discovery is to loft the Upper Atmosphere Research Satellite, a 7-ton, 32-foot spacecraft that will help scientists better fathom global climate shifts and ozone destruction.
Mr. Aftergood of the Federation of American Scientists cautioned that the environmental "costs" of global rocketry were far from clear because of uncertainty over the actual number of solid-fuel rockets fired every year and doubts over the chemistry of ozone destruction. He noted that the Environmental Protection Agency recently reported that the measured ozone loss at the latitudes of the United States was 4.5 to 5 percent in the last decade, more than twice what scientists had previously thought.
"That means the models are wrong," Mr. Aftergood said. "A certain amount of humility is warranted."
Mr. McDonald of Thiokol said that about a dozen new solid-rocket fuels indus

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parier
Caned
aned whales, for their distinctive
to assess damage from rockets. That dolphin-like snout. They are seen so
report is due in 1992.
Some See Hysteria
ozone
said
"It's appropriate to begin a transi-
tion now to cleaner propellants,"
Steven Aftergood, a specialist on
depletion with the Federation
of American Scientists, a private
group based in Washington. "There's
enough evidence of the danger."
But rocket makers and users dis-
"We're a very small, insignifi-
agree.
ly
rarely that it took scientists 15 years
to find enough specimens to feel con-
fident that they were members of a
previously unknown species.
Like other beaked whales, the new-
ly described species, Mesoplodon
peruvianus, has an elongated jaw,
few teeth and apparently feeds on
squid. The species appears to be uni-
formly gray on top, shading to lighter
gray on the underbelly. At birth, the
whale is about 5 feet long, and an
ashed ashore over the
Of the popu
last 15 years. They described their where they occasionally get caught
about
finding earlier this year in Marine up in fisheries and where they may family of toothed-whales came
Mammal Science, a journal of the wash up on the beach when they die,"
Society for Marine Mammology.
this
not
Two sightings of living whales of
species have been reported, but
confirmed, Dr. Mead said. The
whale's range and population are un-
known, but specimens recently found
along the Mexican coast may belong
to this species, he said.
First
Clue in 1976

Just how a type of whale, even a relatively small one, could escape no- Dr. Mead said.

The first clue that an undescribed species of whale might be cruising the Pacific came in 1976 when Dr. Mead found a partial cranium and vertebra in San Andes, Peru. Remains from nine additional whales were found from 1985 to 1989 on the central and southern Peruvian coast. Taken together, the specimens provide persuasive evidence of a dis- species tinct of the genus Ziphiidae has been learned from stranded carcasses that have washed ashore, Dr. Mead said. M. peruvianus is the 13th species of Mesoplodon to be identified, as well as the smallest.

Dr. Mead said that other species of whale, yet to be described, are proba- bly prowling remote parts of the bly prowling remote parts of the ocean. In 1987, scientists described sightings in the eastern tropical Pa- cific of a larger, distinctively colored whale that could be another new spe- cies of Mesoplodon.

were under investigation in the meds try but that each had drawbacks. Some were less powerful, some dan- gerously explosive and some difficult to handle. "We have alternatives," he said, "but the amount of money to develop them isn't worth the impact it's going to have."

Mr. Aftergood disagreed, saying the cleanliness of fuels "ought to be an important factor in the selection of the next generation of rockets," add- ing, "It's just a matter of being envi- ronmentally responsible.'